ARE OYSTERS EDIBLE DURING THE SUMMER SEASON ?

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By

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There is a common belief that oysters should not be eaten in the months containing the letter "r". However, so far as the authors are aware, this belief lacks experimental confirmation.

In the present report, the authors attempted to examine the toxicity of the summer oyster chiefly from the following aspects; the acute toxicity by oral administration to human subjects and by intraperitoneal injection of its extracts into mice, and the chronic toxicity by rat feeding experiments.

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Experimental

1. Oral administration of summer oyster to human subjects.

In the present report, the authors named the oysters caught in the months not containing the letter "r" (from May to August) as "summer oyster" and the oysters taken in the winter months (from December to February) as "winter oyster". The former was sampled once monthly, shucked and seasoned with some vinegar and soy sauce after boiling in water, then administered orally to human subjects.

As shown in Table 1, the summer oyster exhibited no toxicity by oral administration, although its taste and flavour was inferior to that of the winter oyster.

2. Intraperitoneal injection of summer oyster's extracts into mice.

Gonad and hepatopancreas portions of the summer oyster were extirpated, weighed and extracted with ethanol respectively. After removal of ethanol, the

Table 1. Oral administration of summer oysters to human subjects.

Date of sampling	Location	No. of oysters administered	Sex and age of subjects	Symptoms	Remarks
May 17, 1960	Onagawa	5 whole shellfishes (shucked)	48 ♂	No changes	Slight acrid taste (hepatopancreas)
〃	〃	〃	39 ♂	〃	
〃	〃	〃	26 ♂	〃	
June 9, 1960	Mangoku Ura	10 whole shellfishes	39 ♂	No changes	so-called "Mizugaki"
〃	〃	7 〃	26 ♂	〃	
July 4, 1960	Onagawa	4 whole shellfishes	48 ♂	No changes	Gonad matured Curd-like touches in the mouth
〃	〃	〃	39 ♂	〃	
August 15, 1956	Onagawa	5 whole shellfishes	39 ♂	No changes	
〃	〃	〃	26 ♂	〃	

Table 2. Intraperitoneal injection of summer oyster extract into mice.

Date of sampling	Location	Tissue extracted	Extract injected	Results	Remarks
May 17, 1960	Onagawa	Hepatopancreas	10 *ml**	0/3	Survived without changes
〃	〃	Gonad	1.0 *	0/3	
June 9, 1960	Mangoku Ura	Hepatopancreas	0.5 **	0/3	Survived without changes
〃	〃	Gonad	0.5 **	0/3	
July 4, 1960	Onagawa	Hepatopancreas	0.5 **	0/3	Survived without changes
〃	〃	Gonad	0.5 **	0/3	
August 15, 1960	Onagawa	Hepatopancreas	0.5 **	0/3	Survived without changes
〃	〃	Gonad	0.5 **	0/3	

* 2 *ml* extract from 1g wet tissue
** 1 *ml* extract from 1g wet tissue

residual aqueous solution was defatted by shaking with ether, and diluted with water to make a solution containing the extracts from one gram wet tissue per one *ml* (The original solution for injection). It was injected intraperitoneally into the mice of red strain (rr). As seen in Table 2, no toxicity was observed by intraperitoneal injection.

3. Feeding experiment of summer oyster protein using albino rats.

The preparation procedure of the diet is principally based on Suzuki's method (1). The per cent composition of the diet by weight is as follows;

Protein (summer or winter oyster proteins or casein as a control)	10%
Butter (commercial grade)	14%
Protein free milk	28%
Starch	48%

Preparation of oyster protein:

Whole oysters were homogenized and extracted with water. After boiling the aqueous extracts, the resulting coagulated protein was returned to the residue. The combined residue was further extracted with water, followed by the extraction with several portions of ethanol and ether respectively. The residual matter was dried and pulverized.

Preparation of protein free milk:

Commercial skim milk powder was dissolved in hot water and acidulated with a small amount of hydrochloric acid. Coagulated casein was filtered off, and the filtrate was heated until 70—80°C to coagulate lactalbumin. After the removal of lactalbumin, the protein free filtrate was neutralized with caustic soda solution, evaporated to dryness at low temperature and pulverized.

The feeding experiment was carried out from January 30th to March 1st, 1961. Albino rats used were all males of Wistar strain and about 100 g in weight. Thirty grams of the diet was administered in the form of a dumpling per one rat daily. Water was given ad libitum by means of closed type drinking glass vessels. The room temperature was maintained at 9±3°C. The rats were devided into three groups (four rats in each group) corresponding to the kind of protein added. Their body weight increase were measured every other day. The results obtained are indicated in Table 3. The growth curves of the rats in each groups are illustrated in Figs. 1—3.

Table 3. Feeding experiment of oyster protein using albino rats.

Group No.	Contents of diet of each group*	No. and initial body weight of rats	Final body weight of rats	Increase of body weight by feeding	Remarks
1	Summer oyster Protein 3.0g Butter 4.2g Starch 14.4g Protein free milk 8.4g average	1. 105.5g 2. 104.0 3. 114.0 4. 110.0 108.4	151.0g 142.5 172.5 160.5 156.5	45.5g 38.0 58.5 50.5 48.1	Course of the experiment is shown in Fig. 1.
2	Winter oyster Protein 3.0g Butter 4.2g Starch 14.4g Protein free milk 8.4g average	5. 97.5 6. 109.0 7. 124.7 8. 105.0 109.0	138.0 165.5 195.0 132.0 157.6	40.5 56.5 71.0 27.0 48.6	Fig. 2.
3	Casein (control) 3.0g Butter 4.2g Starch 14.4g Protein free milk 8.4g average	9. 102.0 10. 97.0 11. 103.0 12. 108.5 102.6	136.5 140.0 145.0 172.5 148.5	34.5 43.0 42.0 64.0 45.9	Fig. 3.

* This is the quantity of diet given daily per one rat.

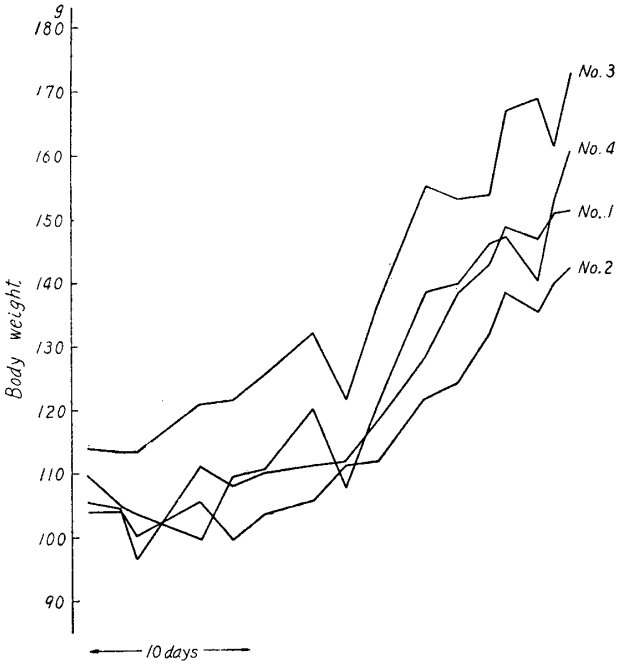

Fig. 1. Growth curve of rats fed on summer oyster protein.

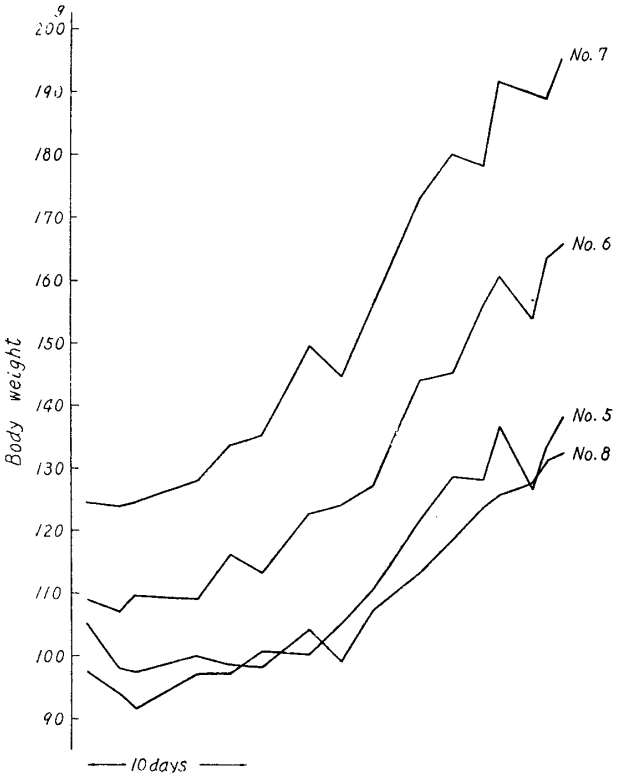

Fig. 2. Growth curve of rats fed on winter oyster protein.

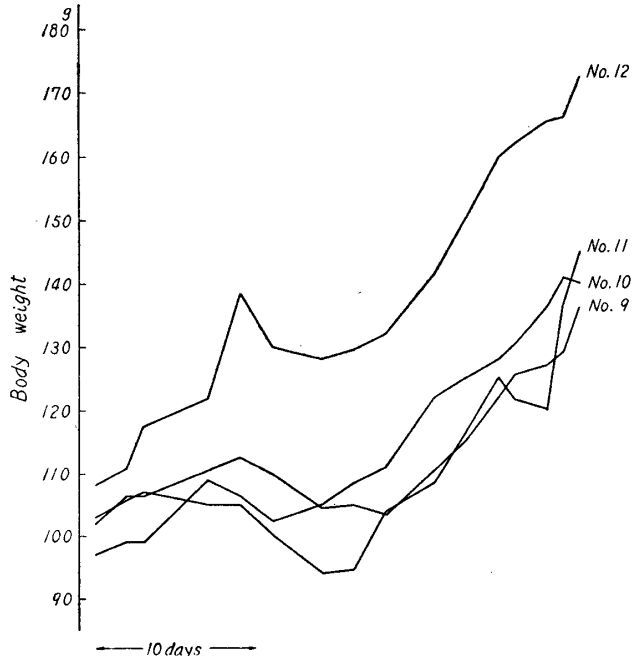

Fig. 3. Growth curve of rats fed on casein (control).

Discussion and conclusion

On the toxicity of "summer oyster", the authors in the first place attempted to examine the acute toxicity by per os administration of it to human subjects. However, under the conditions employed, no sign of intoxication was revealed.

Secondly, the authors injected summer oyster extracts intraperitoneally into mice. Also in this case, they could observe no abnormal symptoms. Although the acute toxicity was negative, however, summer is the spawning season when oysters, after the discharge of its sex products, become watery and contain only little solid matter. It lacks flavour and consistency and has an acrid taste. Therefore, from the food technological points of view, it is generally disadvantageous for marketing.

Next, the authors suspected that the toxicity, if any, means the malignant effect on the nutrition of human subjects or animals. Thus they examined the chronic toxicity of summer oyster by the feeding experiments using albino rats. The growth of rats fed on summer oyster protein (Fig. 1) showed no ill effect upon the nutrition of the animals when compared with those of rats fed on winter oyster (Fig. 2) or control casein (Fig. 3). The growth of rats fed on oyster protein is rather superior to that of rats fed on casein. Therefore, in this case, the chronic toxicity, namely, the malignant effect of summer oyster upon the nutrition of animals does not exist. In summary, the authors conclude from the experimental results that the summer oyster, at least in the vicinity of miyagi prefecture, is edible at any time of year, although the summer oyster is inferior in taste and flavour to the winter one.

References

1) Suzuki, U. *et al.* (1922). Sci. Papers Inst. Physic. Chem. Research **1**, (No. 3) 282—336